REMARKS

Attached hereto is a marked-up version of the changes made to the specification by the current amendment. The attached page is captioned "**Version with Markings to Show Changes Made**."

Claims 1 and 11 have been cancelled without prejudice.

Applicants gratefully acknowledge the allowability of claims 2 and 9 if the 35 U.S.C. §112, second paragraph, rejection is overcome and claims 2 and 9 are rewritten in independent form including all the limitations of the base claim and intervening claims.

Claims 2 and 9 have been rewritten in independent form including all the limitations of the base claim and intervening claims. The applicant has deleted the phrase "such as carbon" from the base claim so that the 35 U.S.C. §112, second paragraph, rejection is now moot.

Claims 2-10 and 12-14 are currently pending in this application.

Claims 10, 12, 13 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanei et al. (U.S. Patent No. 5,503,787).

Claim 10 was amended to define that the piezoelectric ceramic material selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on $BaTiO_3$.

Tanei et al. does not describe a device wherein the piezoelectric ceramic material selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on

$BaTiO_3$. Therefore, instant claims 10, 12, 13 and 14 are not anticipated by Tanei et al.

Claims 1, 3-8, 10 and 12-14 are rejected under 35 U.S.C. 103(a) as being obvious over Tanei et al. (U.S. Patent No. 5,503,787) in view of Hiramatsu et al. (U.S. Patent No. 6,489,257) and Tani et al. (U.S. Patent No. 5,981,069).

Claim 1 has been cancelled. Therefore, the rejection of claim 1 is moot. Claims 3-8 depend from 2, which is allowable. Therefore, claims 3-8 are also allowable by virtue of their dependence from an allowable claim.

As mentioned above, Tanei et al. does not describe a device wherein the piezoelectric ceramic material is selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on $BaTiO_3$.

Likewise, neither Hiramatsu et al. nor Tani et al. describe a device wherein the piezoelectric ceramic material is selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on $BaTiO_3$. Therefore, the combination of Tanei et al., Hiramatsu et al. and Tani et al. still lack the limitation of the claimed device, namely, that the piezoelectric ceramic material is selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on $BaTiO_3$.

A showing of all the elements of the claimed device is one of the essential requirements that must be met to establish a *prima facie* case of obviousness (see MPEP § 2142). Absent a teaching or suggestion that the combination of references has all the elements of the instantly claimed device, the references cited above, either alone or in combination, do not

provide a sufficient basis to establish a *prima facie* case of obviousness. Consequently, a person of ordinary skill in the art would not be able to arrive at the claimed invention except through either extensive experimentation or impermissible hindsight. Accordingly, the cited references, in combination, do not render the claims of the instant invention obvious. Therefore, the device of the instant claims is unobvious over Tanei et al. in view of Hiramatsu et al.

Accordingly, the 35 U.S.C. § 103(a) rejection should be withdrawn and claims 3-8, 10 and 12-14 should be allowed.

Claims 10-14 are rejected under 35 U.S.C. 103(a) as being obvious over Kobayashi et al. (U.S. Pat. No. 5,716,481) in view of Tanei et al. (U.S. Patent No. 5,503,787).

Claim 11 has been cancelled. Therefore, the rejection of claim 11 is moot.

Kobayashi et al. does not describe a device wherein the piezoelectric ceramic material is selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on $BaTiO_3$.

Further, Kobayashi et al. describes a method of manufacturing ceramic electronic components involving positioning and printing electrodes on unbaked ceramic layers. This art does not teach or suggest the Applicants' multilayer piezoelectric ceramic device with base metal electrodes, let alone the specific combinations of the components of Applicants' device.

The Applicants' device is substantially free of defects including lack of reduction of PZT or other ceramic material and lack of oxidation of base metals.

Likewise, Tanei et al. does not describe a device wherein the piezoelectric ceramic material is selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on $BaTiO_3$.

Because neither Tanei et al. nor Kobayashi et al. have a piezoelectric ceramic material selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on $BaTiO_3$, the combination of Tanei et al. and Kobayashi et al. still lack the limitation of the instantly claimed device. The instant claim can have a piezoelectric ceramic material, such as, PZT, PMN, bismuth-based piezoelectric materials or lead-free ceramics based on $BaTiO_3$.

Furthermore, the combined teaching of the cited references does not disclose or suggest applicant's specific combination of components as recited in the instant claims.

As mentioned above, a showing of all the elements of the claimed device is one of the essential requirements that must be met to establish a *prima facie* case of obviousness (see MPEP § 2142). Absent a teaching or suggestion that the combination of references has all the elements of the claimed device, the references cited above, either alone or in combination, do not provide a sufficient basis to establish a *prima facie* case of obviousness. Consequently, a person of ordinary skill in the art would not be able to arrive at the claimed invention except through either extensive experimentation or impermissible hindsight.

Accordingly, the cited references, in combination, do not render the claims of the instant invention obvious. Therefore, the device of the instant claims is unobvious over Kobayashi et al. in view of Tanei et al.

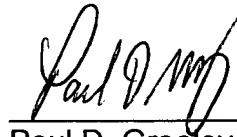
Therefore, the 35 U.S.C. § 103(a) rejection should be withdrawn and claims 10 and 12-14 should be allowed.

Applicants have not renumbered the claims that would result from the cancellation of claims 1 and 11. However, the applicants would renumber the claims prior to allowance of the allowable claims if requested to do so.

In view of the foregoing, Applicants respectfully request reconsideration of the present application and allowance of claims 2-10 and 12-14.

Should there be any further issues, Applicants would welcome a telephone call to facilitate their resolution.

Respectfully submitted,

Date: June 2, 2003 By: 

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

The claims have been amended as follows:

2. (Amended) [The method of claim 1, wherein said piezoelectric ceramic material is] A method of preparing a multilayer piezoelectric device with alternating piezoelectric ceramic layers and base metal layers as electrodes comprising the steps of:

(a) applying onto a first layer, which includes a piezoelectric ceramic material selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on $BaTiO_3$ and a first combination of organic materials, a second layer, which includes a base metal powder having particles, which are coated with material capable of protecting said base metal against oxidation, and a second combination of organic materials, to produce a first structure;

(b) applying onto said first structure a second structure, which is identical to said first structure to produce a multilayer structure;

(c) heating said multilayer structure at a temperature less than 600°C to remove said first and second combinations of organic materials and their

decomposition products to levels below 200 ppm; and thereafter

(d) sintering at a temperature from about 600°C to about 1050°C at a partial pressure of oxygen from about 10^{-3} to 10^{-15} atm to produce said multilayer piezoelectric device with alternating piezoelectric ceramic layers and base metal layers as electrodes.

3. (Amended) The method of claim [1] 2, wherein said base metal is selected from the group consisting of Cu, Ni and alloys thereof.

4. (Amended) The method of claim [1] 2, wherein said first combination of organic materials includes binder, solvents, plasticizers, dispersants, and combinations thereof.

5. (Amended) The method of claim [1] 2, wherein said base metal coating to protect against oxidation is selected from the group consisting of glasses, metal oxides, organic material, noble metals, and combinations thereof.

6. (Amended) The method of claim [1] 2, wherein said second combination of organic materials includes solvents, binder, and combinations thereof.

7. (Amended) The method of claim [1] 2, wherein said heating is at a partial pressure of oxygen from about 10^{-4} atm to ambient atm.

8. (Amended) The method of claim [1] 2, wherein said heating is at a temperature from about 25°C to about 500°C.

9. (Amended) [The method of claim 1, further including a cool-down step of said sintering] A method of preparing a multilayer piezoelectric device with alternating piezoelectric ceramic layers and base metal layers as electrodes comprising the steps of:

(a) applying onto a first layer, which includes a piezoelectric ceramic material selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on $BaTiO_3$ and a first combination of organic materials, a second layer, which includes a base metal powder having particles, which are coated with material capable of protecting said base metal against oxidation, and a second combination of organic materials, to produce a first structure;

(b) applying onto said first structure a second structure, which is identical to said first structure to produce a multilayer structure;

(c) heating said multilayer structure at a temperature less than 600°C to remove said first and second combinations of organic materials and their decomposition products to levels below 200 ppm; thereafter

(d) sintering at a temperature from about 600°C to about 1050°C at a partial pressure of oxygen from about 10^{-3} to 10^{-15} atm to produce said multilayer piezoelectric device with alternating piezoelectric ceramic layers and base metal layers as electrodes; and

(e) cooling-down after said sintering step at a partial pressure of oxygen below 10^{-4} atm.

10. (Amended) A multilayer piezoelectric device with alternating piezoelectric ceramic layers and base metal layers as electrodes prepared by [the process] a method [of claim 1] comprising the steps of:

(a) applying onto a first layer, which includes a piezoelectric ceramic material selected from the group consisting of PZT, PMN, bismuth-based piezoelectric materials, and lead-free ceramics based on $BaTiO_3$ and a first combination of organic materials, a second layer, which includes a base metal powder having particles, which are coated with material capable of protecting said base metal against oxidation, and a second combination of organic materials, to produce a first structure;

(b) applying onto said first structure a second structure, which is identical to said first structure to produce a multilayer structure;

(c) heating said multilayer structure at a temperature less than 600°C to remove said first and second

combinations of organic materials and their decomposition products to levels below 200 ppm; and thereafter

(d) sintering at a temperature from about 600°C to about 1050°C at a partial pressure of oxygen from about 10^{-3} to 10^{-15} atm to produce said multilayer piezoelectric device with alternating piezoelectric ceramic layers and base metal layers as electrodes.